New Products

Direct reading magnetometer (model V-4931DR) is a proton free precession instrument for the measurement of magnetic field from 20,000 to 100,000 gamma. The system uses the proton principle in conjunction with phase-lock circuitry to present the readout of magnetic field intensity on a digital counter and on a strip-chart recorder. The phase-lock system essentially multiplies the precession frequency of the protons in the sensor by the proton constant to provide absolute field intensity. The method is said to yield a highly stable signal, reduce system sensitivity to the effects of ambient noise fields by at least an order of magnitude, and give relative freedom from modulation effects in the precession signal. System response exceeds by two orders of magnitude the steepest field gradients encountered in shipboard surveys, according to the manufacturer. Accuracy is said to be ± 1 gamma. The total range of the instrument is covered in overlapping steps that may be specified by the purchaser.—J.S. (Varian Associates, 611 Hansen Way, Palo Alto, Calif.)

Circle 1 on Readers' Service card

"Intravital" microscope is an integral microscope, specimen holder, and manipulator for direct observation of *in situ* studies on animals as large as dogs. The animal is placed on a 20- by 11-inch mechanical stage mounted on ball bearings with coaxial controls for the coarse cross motion. For smaller animals there is an attachable holder and trough with single-lever cross motion and adjustable range of motion. The stereo microscope has coaxial coarse and fine focusing and can be swung out of the way when necessary. The height of this assembly is adjustable by a crank which controls a vertical screw. The whole apparatus is mounted on a heavy base. Applications include observation of tissue, organs, and cells, effects of experimental drugs, and structure and function of microcirculation. In addition, conversion to photography and cinematography is available.—R.L.B. (E. Leitz, Inc., 468 Park Avenue South, New York 16)

Circle 2 on Readers' Service card

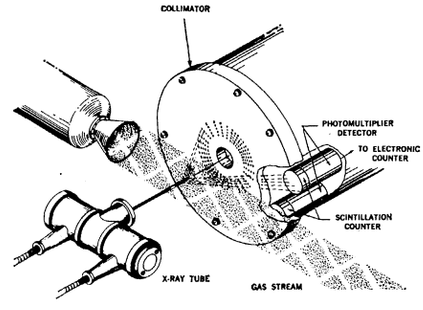
Microminiature **transparent electrical conductors** have been developed for use in electroluminescent *x-y* coordinate display panels. The transparent conductors consist of aluminosilicate glass microcane that is 0.0025 inch in diameter. Each strand is coated with a metal oxide electrically conductive film fused into the surface of the glass. Being marketed initially are 2-inch-long arrays containing 300 parallel strands of conductors in a width of 1 inch. Diameter of the glass wires, the number of fibers per inch of width of the array, and the size of the array, can be varied to meet individual needs. Arrays larger than the 1-by-2-inch size are said to be feasible. Resistivity of the electrically conductive coating is approximately 80 ohm/in.^{2} and it permits light transmission of approximately 70 percent. Tensile strength of the finished fibers lies between 12,000 and 50,000 lb/in.^{2}—J.S. (Corning Glass Works, Corning, N.Y.)

Circle 3 on Readers' Service card

Electron microanalyzer (model AGB-1) irradiates a specimen with energetic electrons causing the material to emit its characteristic x-radiation. By the use of one of the x-ray spectrographic accessories this x-radiation can be detected and related qualitatively and quantitatively to a particular element in the specimen. The microanalyzer features an electron beam voltage adjustable from 2 to 50 kv with a scanning area of 2 by 2 mm or less. Six channels of readout are available, so that up to four spectrometers, a backscatter attachment, and the specimen current facility can be operated simultaneously. Both air-path and vacuum-path spectrometers are available, as are digital readout, additional recorders, and other accessories. Applications of this method include analysis of biological materials, physical, chemical and atomic energy research, and numerous industrial uses.—R.L.B. (Elion Instruments, Inc., U.S. Route 130 North, Burlington, N.J.)

Circle 4 on Readers' Service card

X-ray densitometer is designed for the measurement of the local density of a gas, and especially for the study of plasmas and rocket-nozzle exhaust streams. The instrument measures the small localized volume of gas defined by the intersection of a collimated x-ray beam and a similarly collimated viewing path. The technique used takes advantage of the direct relationship between the mass density sought and the total electron density in the defined volume. The electrons, whether bound or free, act as scattering centers and can be counted by measuring the scattering of the beam of moderately hard



x-rays employed. The x-ray energy is sufficiently high that the scattering from either bound or free electrons is essentially noncoherent. The amount of x-rays scattered into a detector is proportional only to the total electron density in the gas and not to its chemical or thermodynamic state or to stream velocity, providing that the gas is electrically neutral. Measurement of local density in reacting, dissociating, or ionized gas is possible. With mixtures containing hydrogen, the fraction of hydrogen must be known. Density can

The material in this section is prepared by the following contributing writers:

Robert L. Bowman (R.L.B.), with the assistance of Denis J. Prager, Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writers assume responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on pages 95 and 201. Circle the department number of the items in which you are interested on this card.

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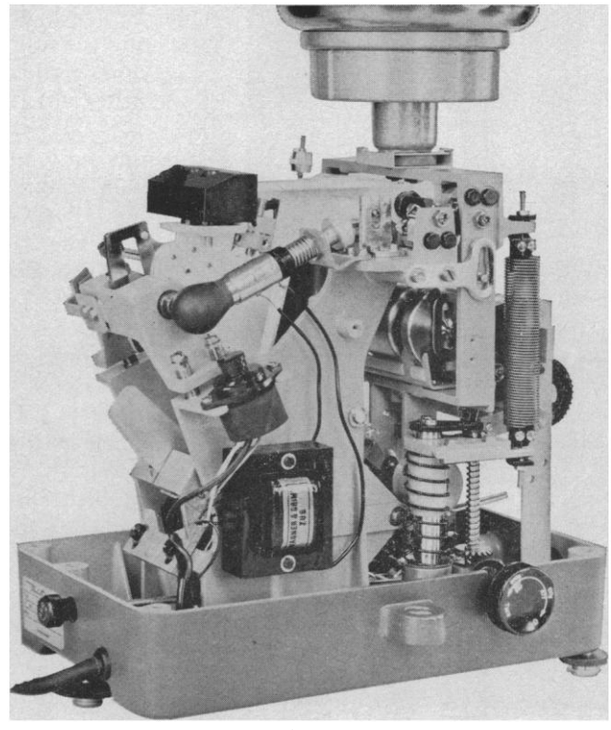

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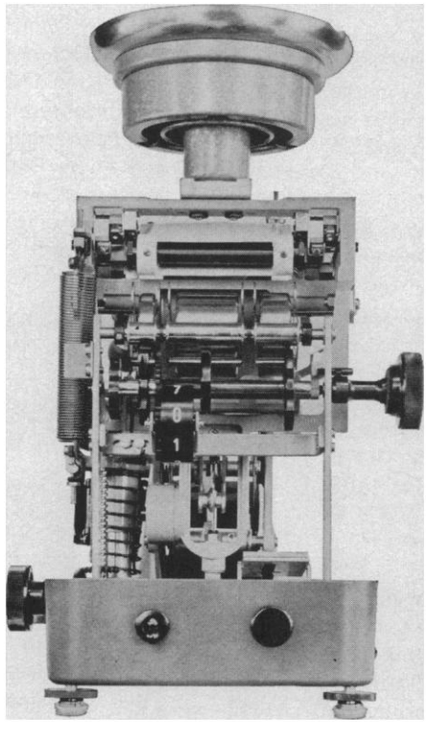

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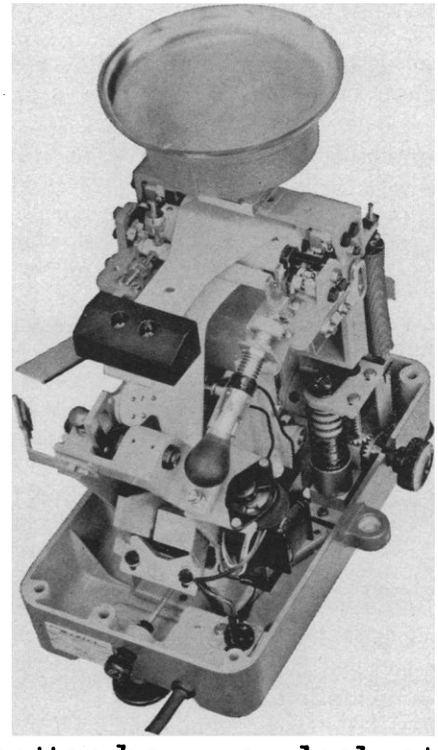

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be measured over the range of density ratio $\rho/\rho_0 = 10$ to 0.0001, where $\rho_0 = 1.288 \times 10^{-3}$ g/cm³. Accuracy is limited at high densities by secondary scattering and at low densities by statistical considerations. Accuracy is said to be better than ±1 percent at density ratio 10, and well within ±5 percent at density ratio 10^{-4}. Typical measurement time ranges from 0.1 sec to 10 sec.—J.S. (Itek Corp., 1450 Page Mill Rd., Palo Alto, Calif.)

Circle 5 on Readers' Service card

Micrometer incorporates a number of design features that are intended to improve ease of reading and hence to reduce errors. To eliminate parallax, the thimble and vernier graduations are on a level with each other. A direct-reading digit display on the thimble allows reading to 0.0005 inch, so that the need for reading a 0.0025-inch scale is eliminated completely. Oblique lines for the 0.100-inch graduations are designed to permit the figure relating to each line to be visible in all reading positions. Carbide measuring faces are used. A setting device allows the thimble to be reset radially or axially.—J.S. (Swiss Precision Instruments, 901 Hyperion Ave., Los Angeles 29, Calif.)

Circle 6 on Readers' Service card

Biological fuel cell which utilizes the energy of bacterial activity can operate for lengthy periods of time and is available as a kit. The 12-cell educational model will produce up to 6 volts at 40 ma, enough to light a small bulb or power a transistor radio. The kit is simple to assemble and once set up needs only occasional food and water. The individual cells are plastic pill bottles filled with powdered brown rice husks and harmless bacteria. Metal plates and wires collect the current to make up a battery of 12 cells.—R.L.B. (Bulk Distributor Corp., P.O. Box 1465, Tacoma 1, Wash.)

Circle 7 on Readers' Service card

Constant-temperature heater permits interchangeable module blocks to be inserted into a recessed chamber or well, for controlled heating. Temperatures are fully adjustable throughout the range from ambient to + 130°C. Control sensitivity is ± 0.5°C. The economical "Temp-Blok" is designed for incubation and inactivation of cultures, enzyme reactions, blood urea nitrogen determinations, melting and boiling points, and a variety of industrial and

clinical laboratory procedures. Light-sensitive specimens can be shielded by using a separate stainless-steel cover. The interchangeable heating blocks come in seven standard sizes to hold varied sizes of test and culture tubes ranging from 6 to 25 mm diameter. Custom modules can also be supplied with other cavity diameters. The heating blocks are black anodized, machined aluminum, and measure 4 inches wide by 3 inches deep by 2 inches high. The heater base is cast aluminum, and measures 8 by 5 by 3 inches high. The unit uses a low-density heater with pilot and cycle lights and an adjustable, bi-metallic thermostat. Four neoprene feet cushion the unit and protect the bench top. The unit may be suspended above the bench with a threaded support rod that screws into the rear. Bulletin 325.—R.L.B. (Lab-Line Instruments, Inc., 3070 W. Grand Ave., Chicago 22, Ill.)

Circle 8 on Readers' Service card

Automatic reagent dispenser is designed for operation with automatic fraction collectors. It permits accurate addition of one or two reagents to each fraction during the fraction-collecting run. As a result, technician time for manual pipetting is completely eliminated, as are also the inaccuracies of measurement due to human variability. Dispensed volumes, ranging from 200 μl to 12.5 ml, are accurate to $\pm$ 0.5 percent and reproducible within $\pm$ 0.5 μl. A wide variety of reagent chemicals can be handled by the dispenser, because all parts of the pumping system in contact with the reagents are chemically inert.—R.L.B. (Research Specialties Co., 200 S. Garrard Blvd., Richmond, Calif.)

Circle 9 on Readers' Service card

Radiant energy heating lamp (model L-85) is designed to provide a source of high temperature for x-ray diffraction, hot-stage microscopy, permeability studies, zone refining, and for specimen heating during mechanical test. The lamp is said to be capable of heating a specimen locally to 800°C, and a combination of two lamps develops temperatures as high as 1100°C. The area of highest heating, where rays are focused, is located 5 inches from the front reflector flange. Each lamp is supplied with a 60-ft^3/min air cooling system for filament cooling. The lamp can be supplied housed in a mobile floor unit fully equipped with a 1000-watt power source, ammeter, power-

stat, and necessary fusing. Operation is on 117 volts. The heater is suggested for use in circumstances in which electrical or mechanical interaction between the specimen and its surroundings or the heater must be avoided.—J.S. (MRC Manufacturing Co., Orangeburg, N.Y.)

Circle 10 on Readers' Service card

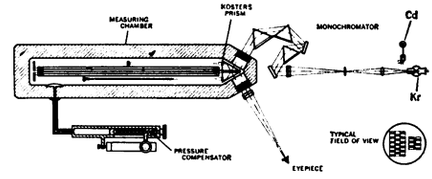
Piezoelectric accelerometer incorporates miniature impedance-matching electronics as an integral part of the transducer. A piezoelectric sensing element and an emitter-follower are contained in a single unit less than 1 in.^{3} in volume. This integral package effectively eliminates both noise and signal attenuation problems normally associated with crystal transducers. The accelerometer features 100-ohm output impedance, operating to 250g (peak) from 6 to 6000 cy/sec over temperatures from −65°F to +200°F. Voltage sensitivity is 20 mv (peak)/g (peak) at 77°F and 100 cy/sec with a 50,000-ohm load. Output voltage is limited to volts peak-to-peak without distortion at room temperature. The unit is stud-mounted and is directly interchangeable with almost all accelerometer-emitter-follower (or cathode-follower) systems. It is particularly useful in airborne applications where a separate accelerometer and emitter-follower are not feasible in the limited space available. The accelerometer achieves even distribution of compression across the crystal by using a seismic mass which is point-loaded by a ball and compliant diaphragm. This technique assures "sensitive-axis isolation," maximizing the piezoelectric effect in the desired axis while minimizing response to motion in the cross-axis. Cross-axis response is 5 percent; amplitude linearity is 1 percent. Power requirements are 28 volts ± 2 ma maximum. Weight is 1.5 oz, excluding cable.—R.L.B. (Consolidated Electrodynamics Corp., 360 Sierra Madre Villa, Pasadena, Calif.)

Circle 11 on Readers' Service card

Low-frequency **two-phase decade oscillator** (type 308G) provides two output signals with 90-deg phase differences from 0.1 cy to 1 kcy/sec. The amplitudes of both signals are maintained essentially constant as frequency is varied. Distortion and hum are said to be negligible and the residual d-c component can be set to zero for both output signals. Frequency can be set from 0.01 to 999 by three digital dials and a range multiplier. Accuracy of frequency setting is said to be ±2 percent and stability within 0.2 percent after warmup. Phase difference between the two signals is 90 ±2 deg, and amplitude can be adjusted between 0 and 5.5 volts r.m.s. Both output attenuators have five coarse steps with 1-percent accuracy and a continuously variable vernier between steps, adjustable with 5-percent accuracy. Output voltage is uniform within 3 percent over the entire frequency range without adjustment. An output meter permits reading of either reference or quadrature component amplitude with 3-percent accuracy.—J.S. (AD-Yu Electronics, Inc., 249 Terhune Ave., Passaic, N.J.)

Circle 12 on Readers' Service card

Length comparator is capable of measuring gage blocks of any length up to 1 m by using interferometric principles. Measurement is made with light of the krypton-86 orange-red line. The comparator consists of a krypton-lamp light source, a collimator, a triple-prism monochromator, a Koesters prism that separates the light into two coherent beams, a measuring trough in which the gage block to be measured is placed, and a telescope objective of 1200-mm focal length through which the interference fringes are viewed.



Measurement and control of environmental factors in the trough are provided. Refractive index of the air is determined by means of a built-in vacuum-chamber system. Measurements are made simultaneously in parallel air-filled and evacuated chambers and the difference is shown in the instrument's eyepiece. Air pressure is controlled by adding or removing liquid contained in an elastic body. Volume compensating blocks are provided for different sized gage blocks. Temperature inside the trough is maintained by liquid flowing through hollow chambers in the walls and is controlled by a thermostat. Measurements can be made at various temperatures in order to determine the coefficient of thermal expansion of the gage block. Gage-block temperature is measured by means of a built-in platinum resistance thermometer

and two thermocouples. Accuracy of temperature measurement is said to be ± 0.001°C. Moisture is removed from the air in the measuring trough by pumping through a dehumidifying system. Rotation of mirrors and other motions are produced by oil-pressure controls without friction or lost motion and without generation of heat within the trough. Whole-number readings of interference fringes are obtained by adjusting the air-pressure compensator. Fractional values resulting from the refraction of the air in the measuring trough are subtracted from the whole-number readings to give vacuum values. —J.S. (Carl Zeiss, Inc., 444 Fifth Ave., New York 18)

Circle 13 on Readers' Service card

Wet analysis kit is designed to perform titrations, oxidation-reduction, and *p*H measurements with a minimum of set-up time. This integrated instrument consists of variable-speed magnetic stirrer and specially designed support bar, clamps, and burettes. The *p*H millivolt meter probe, along with two burettes or one burette and a thermometer, can be suspended in the test solution at once, so that simultaneous redox and *p*H measurements can be made, as well as titrations. The standard meter reads 0 to 14 *p*H with a resolution of 0.05 *p*H and up to 700 mv full scale. Other meters are available, as well as a combined meter and strip-chart recorder. The titra-kit is meant particularly for routine laboratory wet analysis and as an aid in science teaching.—R.L.B. (Analytical Measurements, Inc., 490 Morris Ave., Summit, N.J.)

Circle 14 on Readers' Service card

Trigger delay generator (model 2A) provides controlled delayed pulses for triggering laboratory equipment from either an optical or an electrical input. Optical triggering is obtained by aiming a 5-foot (1.5 m) fiber-optic probe at the luminous event to be studied. A 250-μw signal on the photodiode is sufficient to produce a low-impedance output triggering pulse adjustable from 50 to 500 volts. Thirty attenuation levels are available for the optical input, and input threshold can be adjusted to provide an output pulse when the desired input amplitude is reached. A monitor output permits the optical signal to be observed on an oscilloscope. Superimposed timing marks show both the triggering threshold of the input and the delayed output pulse.

The electrical input will accept a fast-rising pulse of 1 to 500 volts. The output triggering pulse can be delayed in four decades from 0 to 99.99 μsec with reference to the zero-delay pulse. The latter appears immediately after the input signal with 30 nsec internal delay. Repeatability of delay setting is said to be ± 0.01 percent of the indicated setting. Delay circuits are transistorized. The 10-, 1-, and 0.1-μsec delays are generated by discharging an *LC* circuit into a diode with nanosecond recovery time and detecting the half-cycle point of the oscillation. The 0.01-μsec delay is generated by varying the amount of charge stored in a diode and driving it off at a constant rate. The delay is the recovery time of the diode.—J.S. (Space Technology Laboratories, Inc., 139 Illinois St., El Segundo, Calif.)

Circle 15 on Readers' Service card

Solar radiation simulator (model ME6) uses a four-lens quartz optical system to irradiate satellites and other space vehicles with simulated sun radiation. A single simulator can irradiate a satellite of 4-ft diameter with intensity equal to that to which it would be exposed in the space above the earth's atmosphere. The device uses a zoom optical system to permit the intensity of radiation to be reduced or increased by changing the size of the irradiated area. By this means, radiation conditions near planets other than the earth can be simulated.—J.S. (Genarco, Inc., 97–04 Sutphin Blvd., Jamaica 35, N.Y.)

Circle 16 on Readers' Service card

Industrial **x-ray film processor** (model B) delivers dry, ready-to-read industrial radiographs in 11 minutes. Capacity of the processor is 60 14- by 17-inch (36 by 43 cm) sheets of film per hour. It processes the manufacturer's industrial x-ray film types AA and M in all listed sheet sizes and in continuous lengths up to 17 inches wide at the rate of 16 in./min (41 cm/min). The equipment occupies less than 10 ft^2 (3 m^2) of floor space.—J.S. (Eastman Kodak Co., Rochester, N.Y.)

Circle 17 on Readers' Service card

Digital multimeter (model 2643) measures a-c and d-c voltages from 1 mv to 1000 volts and resistance from 0.1 ohm to 10 megohms. The bridge switching arrangement uses reed relays. Automatic or manual polarity and range switching are provided as standard features. The measurements are displayed as four decimal digits. A front-panel null meter allows a fifth digit to be resolved. Features mentioned by the manufacturers include overload protection of input circuitry, transistor-resistor logic circuitry, floating operation to 500 volts, 100-db common-mode rejection, optional internal buffer and printout, and noise-rejecting input filtering with variable sensitivity.—J.S. (Houston Instrument Corp., 4950 Terminal Ave., Bellaire 101, Tex.)

Circle 18 on Readers' Service card

Safety fuze interrupter for oceanographic and seismic research prevents accidental detonation of experimental explosive charges by interrupting the safety fuze until arming depth is reached. The device itself contains no explosive. In operation, the desired lengths of fuze are inserted and crimped. The device remains inoperative until a safety pin is manually removed, after which it can only be armed by hydrostatic pressure. At a depth of 25 ft (7.6 m), a pressure diaphragm overcomes a spring force, causing an arming slider to move into position.—J.S. (Daystrom, Inc., Manchester Rd., Poughkeepsie, N.Y.)

Circle 19 on Readers' Service card

Spectrum-line measuring comparator measures the separation of parallel lines within the range 5 μ to 250 mm and will accept line widths from 5 μ to 1 mm. In operation, light passing through the object being measured from a substage light source, or reflected by an opaque object from an optionally available vertical illumination system, is focused by a projection lens and split into two beams. Part of the light passes to a viewing screen and part through a rotating prism to a slit. The prism produces a periodic scanning of the image on the slit, allowing a multiplier phototube behind the slit to sense the profile of the line for display on a cathode-ray oscilloscope. Synchronization of the horizontal sweep of the oscilloscope with the line scan is accomplished by means of a light-interrupter sector attached to the rotating prism. The mirror that is used to reflect light to the viewing screen has a transparent section that allows light to fall on a transmission recording multiplier phototube. The output of the latter is fed into a cathode follower that in turn drives a density-indicating meter or a recorder. Slits in front of

each phototube are adjustable to 20-mm width. As the carriage of the comparator is advanced and a line comes into view, two traces appear on the oscilloscope. These travel toward each other, and centering of the line in the optical system is indicated by coincidence of the two traces. One millimeter on the oscilloscope screen corresponds to 1 μ on the object; half this misregistration is said to be easily detected. Carriage position is read from a lead-screw dial. The lead screw has a corrector bar assembly said to correct the screw to an accuracy of ± 1.0 μ over the total traverse of 250 mm. For alignment of the object, the 34-inch (86 cm) carriage is provided with a 25-mm cross-slide adjustment and a rotational adjustment of ± 3 deg. The instrument is normally supplied with a projection lens (focal length 2.54 cm) providing magnification of 20 at the viewing screen and oscilloscope. Other magnifications or a zoom lens providing variable magnification from 5 to 22 can be supplied. Available on special order are a 100-mm cross traverse, a system for electronic z-axis fringe readout, digitized readout for the lead screw, and an inch version with 50×10^{-6} inch least count.—J.S. (Grant Instruments, 5812 College Ave., Oakland, Calif.)

Circle 20 on Readers' Service card

Time lapse apparatus is a complete system for taking motion pictures through the microscope. The instrument includes a desk-mounted vibration-isolation system, camera and drive assembly (with eight framing rates varying from ¼ to 32 frames per minute), viewing eyepiece, variable time exposure control (from ½ to 6 sec) for continuous light photography, and trigger for flash synchronization. The Sage series 300 accepts any steady light source supplied with the microscope. Particular attention has been given to preventing both low- and high-frequency vibrations from affecting the pictures. Available as an optional accessory is a custom incubator designed to fit the selected microscope.—R.L.B. (Sage Instruments, Inc., 2 Spring St., White Plains, N.Y.)

Circle 21 on Readers' Service card

Rotary transformers are electromagnetic devices used to transfer electrical signals or power from a rotatable to a stationary member, thus avoiding problems of noise, contact interruption, arc over, wear, dust, and contamination

that occur when slip rings are used. Signal and power transfer are accomplished electromagnetically through an air gap. Operation is essentially the same as that of a conventional transformer, except that the primary is concentrically rotatable with respect to the secondary. However, because the air gaps, geometry, and material requirements cause an increase in eddy currents, these must be carefully considered. Power transfer efficiency of 98.5 percent at 100 watts, and signal transfer linearity better than 1 percent with cross-talk less than 30 db at 1 Mcy/sec, are said to have been attained.—J.S. (Data Tech, 238 Main St., Cambridge 42, Mass.)

Circle 22 on Readers' Service card

Heat flux meter measures the rate of heat flow at precise locations within a material. The instrument functions by measuring the temperature difference between two closely spaced parallel planes by means of a thermopile whose hot and cold junctions are positioned in these planes. The approach to steady-state conditions is monitored by a separate thermocouple that measures the temperature of the lead plane. Heat flux is calculated with the value of the conductivity at this measured temperature. To prevent heat flux distortion, the device is constructed of the same material as that through which the heat is flowing. It can be constructed of any machinable material. To obtain rapid response, the mass of the thermocouple elements employed has been held to a minimum.—J.S. (Science Products Corp., Route 46, Dover, N.J.)

Circle 23 on Readers' Service card

Sampling oscilloscope concepts and systems are described in a 12-page illustrated report. The sampling oscilloscope permits the observation of phenomena that are too rapid for writing speed of the oscilloscope. It accomplishes this by taking advantage of the repetitive nature of the signal to be observed, sampling a different phase of the signal at each successive repetition and synthesizing the individual signals into a representation of the complete wave form. The report details 11 phases of sampling technology: basic philosophy; pulse definitions and coaxial cable considerations; typical sampling systems; rise-time factors; loop gain; sampling density; dot transient response; random noise smoothing; changing sensitivity; adding d-c offset

voltage to the signal; and timing systems. More than 20 circuit and block diagrams and response curves are included to illustrate a variety of sampling methods. Also included is a chart of coaxial cable length versus time for 52- and 125-ohm lines.—J.S. (Tektronix, Inc., Box 500, Beaverton, Ore.)

Circle 24 on Readers' Service card

Liquid scintillation spectrometer (model 2210) has been designed as a fully integrated automatic system. It occupies less than 7 ft^2 of bench space, and has capacity for 100 counting vials within the refrigerated sample compartment which is an integral part of the instrument cabinet. The entire 100-sample capacity may be loaded or unloaded in one convenient step by simply removing the lightweight sample tray. The model 2210 can also speed research where routine screening procedures are employed to identify a relatively few active samples among the many which must be analyzed. The unique "low sample reject system" automatically counts or rejects samples according to activity. In a single run of samples this exclusive feature can save several hours' counting time.—R.L.B. (Vanguard Instrument Co., P.O. Box 244, LaGrange, Ill.)

Circle 25 on Readers' Service card

X-Y recorder (model F-80) is a flat-bed instrument using a vacuum paper hold-down system. Features of the instrument are a built-in time base with adjustable margin controls and an automatic pen return with both manual and automatic cycling. A small permanent magnet keeps the pen attached to the pen holder, allowing easy removal for servicing. Fourteen d-c voltage ranges are furnished from 0.5 to 50 mv/in. (0.2 to 20 mv/cm), with vernier adjustment between ranges. Maximum paper size is 11 by 17 inches (28 by 43 cm). Accuracy is said to be ±0.2 percent and reproducibility ±0.1 percent. A Zener diode is used in the recorder as voltage reference. Pen speed is 17 in./sec (43 cm/sec) on both axes. The time base provides seven fixed speeds between 50 and 0.5 sec/in. (20 and 0.2 sec/cm). Full-scale zero adjustment plus 100-percent suppression is provided on each axis. The instrument is completely transistorized.—J.S. (Varian Associates, 611 Hansen Way, Palo Alto, Calif.)

Circle 26 on Readers' Service card

INDEX TO ADVERTISERS, 12 July 1963

PERSONNEL PLACEMENT

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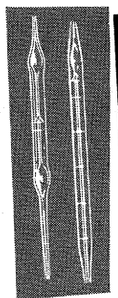

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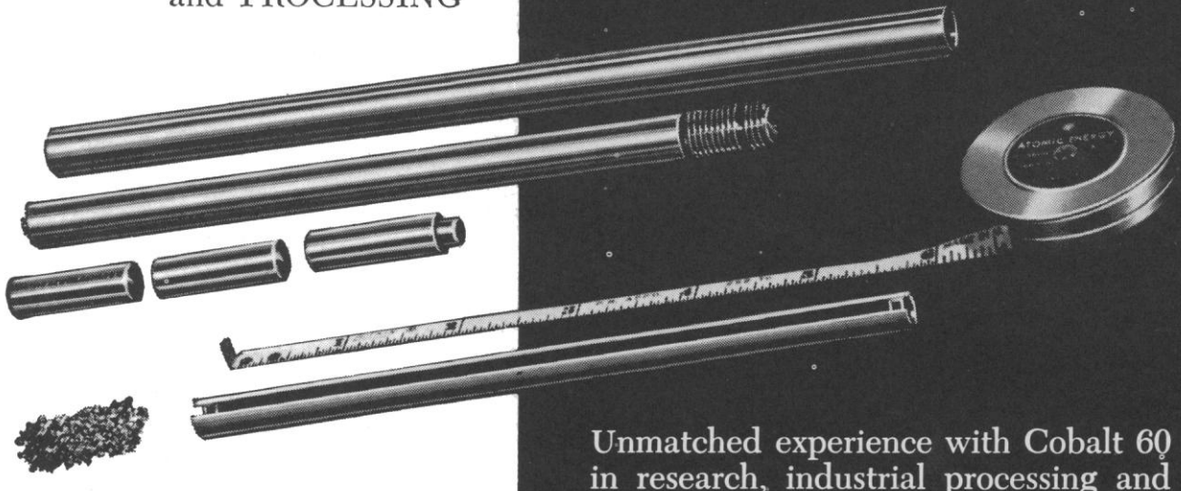

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